

What is claimed as new and desired to be protected by Letters Patent of the United States is:

1. A computerized method for analyzing a plurality of amino acids in a fluid sample by a user, comprising the steps of:

introducing said sample into a buffer solution;

passing said sample in said buffer solution through a separation column;

setting a lithium ion concentration in said buffer to no more than 0.3 mols/L up to a time before  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA) is eluted; and

displaying said analysis for said user.

2. The computerized method of claim 1 further comprising setting a pH to no more than 3.5 for said buffer solution up to a time before said  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA) is eluted.

3. The computerized method of claim 1 further comprising setting said lithium ion concentration and a pH in said buffer solution to increase in a gradient fashion within a time of eluting from  $\gamma$ -amino-n-butyric acid ( $\gamma$ -ABA) to hydroxylysine (Hyls).

4. The computerized method of claim 3 further comprising setting said lithium ion concentration to increase from 0.44 mols/L to 1.00 mol/L and said pH to increase from 3.66 to 4.1 in said buffer solution.

5. The computerized method of claim 1 further comprising setting said lithium ion concentration at 0.81 mols/L and a pH at 4.00 in said buffer solution within an elution time from hydroxylysine (Hylys) to histidine (His).

6. The computerized method of claim 5 further comprising setting the lithium ion concentration at 1.00 mol/L and said pH at 4.1 in said buffer solution after the elution of histidine (His).

7. The computerized method of claim 1 further comprising setting a column temperature at 70°C within an elution time from valine (val) to homocitrulline (Hcit).

8. The computerized method of claim 1 further comprising setting a column temperature at 70°C within an elution time of tyrosine (Tyr).

9. The computerized method of claim 1 further comprising setting a column temperature at 63°C within an elution time of from cysteine-homocysteine mixed disulfides (Cys-Hcys) to tryptophane (Trp).

10. The computerized method of claim 1 wherein said plurality of

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amino acids is selected from the group comprising: phosphoserine (P-Ser),  
taurine (Tau), phosphoethanolamine (PEA), urea (Urea), asparinic acid (Asp),  
hydroxyproline (Hypro), methionine sulfoxide (MetSOX), threonine (Thr),  
Serine (Ser), asparagine (AspNH<sub>2</sub>), glutamic acid (Glu), glutamine (GluNH<sub>2</sub>),  
5 Sarcosine (Sar),  $\alpha$ -aminoadipic acid ( $\alpha$ -AAA), proline (Pro), glycine (Gly),  
alanine (Ala), citrulline (Cit),  $\alpha$ -amino-n-butyric acid ( $\alpha$ -ABA), valine (Val),  
pipercolic acid (Pipeco), homocysteine (HCysH), methionine (Met),  
homocitrulline (HCit), allo-isoleucine (Allo-Ile), cystine (Cys), saccharopin  
(Saccha), isoleucine (Ile), leucine (Leu), tyrosine (Tyr), cystathionine (Cysthi),  
10 phenylalanine (Phe), allgininosuccinic acid (ASA), cysteine-homocysteine  
mixed disulfides (Cys-Hcys),  $\beta$  -alanine (  $\beta$  -Ala), aminolevulinic acid  
(ALeVA),  $\beta$  -aminoisobutyric acid (  $\beta$  -AiBA),  $\gamma$ -amino-n-butyric acid ( $\gamma$ -ABA),  
homocystine (HCys), alugininosuccinic acid anhydride 1 (ASA-Anhy1),  
ethanolamine (EOHNH<sub>2</sub>), tryptophan (Trp), ammonia (NH<sub>3</sub>), hydroxylysine  
15 (Hyls), aminoethylcysteine (AEC), ornithine (Orn), lysine (Lys), 1-  
methylhistidine (1Mehis), histidine (His), 3-methylhistidine (3Mehis), anserine  
(Ans), carnosine (Car) and arginine (Arg).

11. An apparatus for analyzing a plurality of amino acids in a fluid  
sample by a user comprising:

a container for supplying a buffer solution;

a control valve for controlling a lithium ion concentration and pH of  
said buffer solution;

an auto sampler for supplying said fluid sample;

a separation column for separating said plurality amino acids in said  
buffer fluid sample; and

a processor in communication with said control valve and said auto  
sampler said processor being programmed for:

introducing said sample into a buffer solution;

passing said sample in said buffer solution through a separation  
column;

setting a lithium ion concentration in said buffer to no more than 0.3  
mols/L up to a time before  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA) is eluted; and

displaying said analysis for said user.

12. The apparatus of claim 11 further comprising setting a pH to no  
more than 3.5 for said buffer solution up to a time before said  $\beta$ -  
aminoisobutyric acid ( $\beta$ -AiBA) is eluted.

13. The apparatus of claim 11 further comprising setting said lithium ion concentration and a pH in said buffer solution to increase in a gradient fashion within a time of eluting from  $\gamma$ -amino-n-butyric acid ( $\gamma$ -ABA) to hydroxylysine (Hyls).

14. The apparatus of claim 13 further comprising setting said lithium ion concentration to increase from 0.44 mols/L to 1.00 mol/L and said pH to increase from 3.66 to 4.1 in said buffer solution.

15. The apparatus of claim 11 further comprising setting said lithium ion concentration at 0.81 mols/L and a pH at 4.00 in said buffer solution within an elution time from hydroxylysine (Hyls) to histidine (His).

16. The apparatus of claim 15 further comprising setting the lithium ion concentration at 1.00 mol/L and said pH at 4.1 in said buffer solution after the elution of histidine (His).

17. The apparatus of claim 11 further comprising setting a column temperature at 70°C within an elution time from valine (val) to homocitrulline (Hcit).

18. The apparatus of claim 11 further comprising setting a column temperature at 70°C within an elution time of tyrosine (Tyr).

19. The apparatus of claim 11 further comprising setting a column temperature at 63°C within an elution time of from cysteine-homocysteine mixed disulfides (Cys-Hcys) to tryptophane (Trp).

20. The apparatus of claim 11 wherein said plurality of amino acids is selected from the group comprising: phosphoserine (P-Ser), taurine (Tau), phosphoethanolamine (PEA), urea (Urea), aspartic acid (Asp), hydroxyproline (Hypro), methionine sulfoxide (MetSOX), threonine (Thr), Serine (Ser), asparagine (AspNH<sub>2</sub>), glutamic acid (Glu), glutamine (GluNH<sub>2</sub>), Sarcosine (Sar),  $\alpha$ -aminoadipic acid ( $\alpha$ -AAA), proline (Pro), glycine (Gly), alanine (Ala), citrulline (Cit),  $\alpha$ -amino-n-butyric acid ( $\alpha$ -ABA), valine (Val), pipelicolic acid (Pipeco), homocysteine (HCysH), methionine (Met), homocitrulline (HCit), allo-isoleucine (Allo-Ile), cystine (Cys), saccharopin (Saccha), isoleucine (Ile), leucine (Leu), tyrosine (Tyr), cystathionine (Cysthi), phenylalanine (Phe), allgininosuccinic acid (ASA), cysteine-homocysteine mixed disulfides (Cys-Hcys),  $\beta$ -alanine ( $\beta$ -Ala), aminolevulinic acid (ALeVA),  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA),  $\gamma$ -amino-n-butyric acid ( $\gamma$ -ABA), homocystine (HCys), alugininosuccinic acid anhydride 1 (ASA-Anhy1), ethanolamine (EOHNH<sub>2</sub>), tryptophan (Trp), ammonia (NH<sub>3</sub>), hydroxylysine (Hylys), aminoethylcysteine (AEC), ornithine (Orn), lysine (Lys), 1-methylhistidine (1Mehis), histidine (His), 3-methylhistidine (3Mehis), anserine

(Ans), carnosine (Car) and arginine (Arg).

21. A method for analyzing a plurality of amino acids in a fluid sample comprising the steps of:

introducing said sample into a buffer solution;

5 passing said sample in said buffer solution through a separation column; and

setting a lithium ion concentration in said buffer to no more than 0.3 mols/L up to a time before  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA) is eluted.

10 22. The method of claim 21 further comprising setting a pH to no more than 3.5 for said buffer solution up to a time before said  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA) is eluted.

15 23. The method of claim 21 further comprising setting said lithium ion concentration and a pH in said buffer solution to increase in a gradient fashion within a time of eluting from  $\gamma$ -amino-n-butyric acid ( $\gamma$ -ABA) to hydroxylysine (Hyllys).

24. The method of claim 23 further comprising setting said lithium ion concentration to increase from 0.44 mols/L to 1.00 mol/L and said pH to

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increase from 3.66 to 4.1 in said buffer solution.

25. The method of claim 21 further comprising setting said lithium ion concentration at 0.81 mols/L and a pH at 4.00 in said buffer solution within an elution time from hydroxylysine (Hyllys) to histidine (His).

26. The method of claim 25 further comprising setting the lithium ion concentration at 1.00 mol/L and said pH at 4.1 in said buffer solution after the elution of histidine (His).

27. The method of claim 21 further comprising setting a column temperature at 70°C within an elution time from valine (val) to homocitrulline (Hcit).

28. The method of claim 21 further comprising setting a column temperature at 70°C within an elution time of tyrosine (Tyr).

29. The method of claim 21 further comprising setting a column temperature at 63°C within an elution time of from cysteine-homocysteine mixed disulfides (Cys-Hcys) to tryptophane (Trp).

30. The method of claim 21 wherein said plurality of amino acids is selected from the group comprising: phosphoserine (P-Ser), taurine (Tau), phosphoethanolamine (PEA), urea (Urea), asparginic acid (Asp),

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hydroxyproline (Hypro), methionine sulfoxide (MetSOX), threonine (Thr),  
 Serine (Ser), asparagine (AspNH<sub>2</sub>), glutamic acid (Glu), glutamine (GluNH<sub>2</sub>),  
 Sarcosine (Sar),  $\alpha$ -aminoadipic acid ( $\alpha$ -AAA), proline (Pro), glycine (Gly),  
 analanine (Ala), citrulline (Cit),  $\alpha$ -amino-n-butyric acid ( $\alpha$ -ABA), valine (Val),  
 5    pipecolic acid (Pipeco), homocysteine (HCysH), methionine (Met),  
 homocytulline (HCit), allo-isoleucine (Allo-Ile), cystine (Cys), saccharopin  
 (Saccha), isoleucine (Ile), leucine (Leu), tyrosine (Tyr), cystathionine (Cysthi),  
 phenylalanine (Phe), allgininosuccinic acid (ASA), cysteine-homocysteine  
 mixed disulfides (Cys-Hcys),  $\beta$ -alanine ( $\beta$ -Ala), aminolevulinic acid  
 10    (ALeVa),  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA),  $\gamma$ -amino-n-butyric acid ( $\gamma$ -ABA),  
 homocystine (HCys), alugininosuccinic acid anhydride 1 (ASA-Anhy1),  
 ethanolamine (EOHNNH<sub>2</sub>), tryptophan (Trp), ammonia (NH<sub>3</sub>), hydroxylysine  
 (Hyls), aminoethylcysteine (AEC), ornithine (Orn), lysine (Lys), 1-  
 methylhistidine (1Mehis), histidine (His), 3-methylhistidine (3Mehis), anserine  
 15    (Ans), carnosine (Car) and arginine (Arg).

31. A computerized method for analyzing a plurality of amino acids  
 in a fluid sample by a user, comprising the steps of:

introducing said sample into a buffer solution;

passing said sample in said buffer solution through a separation

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column;

setting a lithium ion concentration in said buffer to no more than 0.3 mols/L up to a time before  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA) is eluted;

5 setting a pH to no more than 3.5 for said buffer solution up to a time before said  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA) is eluted; and

displaying said analysis for said user.

32. An apparatus for analyzing a plurality of amino acids in a fluid sample by a user comprising:

a container for supplying a buffer solution;

10 a control valve for controlling a lithium ion concentration and pH of said buffer solution;

an auto sampler for supplying said fluid sample;

a separation column for separating said plurality amino acids in said buffer fluid sample; and

15 a processor in communication with said control valve and said auto sampler said processor being programmed for:

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introducing said sample into a buffer solution;

passing said sample in said buffer solution through a separation column;

5        setting a lithium ion concentration in said buffer to no more than 0.3 mols/L up to a time before  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA) is eluted;

      setting a pH to no more than 3.5 for said buffer solution up to a time before said  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA) is eluted; and

displaying said analysis for said user.

10        33. A method for analyzing a plurality of amino acids in a fluid sample comprising the steps of:

introducing said sample into a buffer solution;

passing said sample in said buffer solution through a separation column;

15        setting a pH to no more than 3.5 for said buffer solution up to a time before said  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA) is eluted; and

      setting a lithium ion concentration in said buffer to no more than 0.3

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mols/L up to a time before  $\beta$ -aminoisobutyric acid ( $\beta$ -AiBA) is eluted.